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ON THE MECHANISM OF THE ACTION OF THE 'RELAXING FACTOR' ON THE MOVEMENT OF THE FLAGELLUM-MODEL OF THE SPERMATOZOA IN SOME MARINE FORMS

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It has been reported that when histidine or other chelating substance is added to the sperm suspension of the starfish the sperm become suddenly active both as regards motility and respiration, suggesting that some metals are involved in the motility of the sperm. In this study, attempts were made to examine the mode of action of chelating agents using glycerol-extracted sperm-model.

Glycerol-extracted spermatozoa of the sea urchin, *Hemicentrotus pulcherrimus*, and of the starfish, *Asterias amurensis*, which were deprived of ATP, soluble enzymes and some of the myogens and retained only contractile elements, could exhibit no undulating motion by the mere addition of ATP (1 mM) and Mg^{++} (5 mM), but became vigorously motile on further addition of metal-chelating agents (5–10 mM) such as histidine, cysteine and ethylendiaminetetraacetic acid (EDTA). For the undulating motion of the sperm-model, all of the ATP, Mg^{++} and some chelating agents appeared to be indispensable, since if any one of them was excluded, the model was no longer able to undulate. The indispensability of the metal-chelating agent for the undulation of the sperm-model, in which only the contractile elements are preserved, suggests the possibility that the chelating agent is acting on the motor system and not on the metabolic system of the spermatozoa.

Meanwhile, it has also been found that a water extract of the frog muscle, in which the 'Marsh-Bendall factor' or the 'relaxing factor' was contained, could induce the motion of this flagellum-model in the co-existence of ATP and Mg^{++}. The same factor could also be extracted from the echinoderm sperm in the same way as from the muscle. It seems likely, therefore, that the 'relaxing factor' itself is effective in the induction of the movement of the sperm-model, and that the action of the 'relaxing factor' is associated with some chelating agents. Since the undulating motion of the sperm consists of the two phases, contraction and relaxation, it may be supposed that chelating agents are acting on the sperm motility by activating the 'relaxation phase'.